Pest Leaflet

Pacific Forestry Centre 506 West Burnside Road Victoria, B.C.

Phomopsis (*Diaporthe*) canker of Douglas-fir in British Columbia

by

A. Funk

Introduction

Phomopsis (Diaporthe) canker of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) is caused by the fungus *Diaporthe lokoyae* Funk (Ascomycetes). It is referred to as Phomopsis canker because the asexual stage of the fungus, *Phomopsis lokoyae* Hahn (5), was found much earlier than the *Diaporthe* or sexual stage (4). The disease is troublesome in young plantations and in natural regeneration, especially following drought conditions in the growing period (2).

The disease occurs on the west coast of North America from British Columbia to California. Records in British Columbia are chiefly from southern Vancouver Island and the lower mainland (1). *Diaporthe* causes stem cankers, leader and branch dieback in trees from seedling to pole size.

Hosts and distribution

The disease is important only on Douglas-fir, but has also been found on other conifers. In a recent outbreak of dieback in western red cedar (*Thuja plicata* Donn), *Diaporthe* appeared to be causing some damage. Badly suppressed saplings of western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) are also occasionally killed by *Diaporthe*.

The disease is widespread, though sporadic, throughout the range of coastal Douglas-fir. One of the chief factors in disease development is stress due to summer drought. The first described outbreak in California (2), and subsequent observations in British Columbia (6), have established this relationship, but other unknown factors also appear to affect the disease. An outbreak in a pole-size plantation in the Cowichan Valley in 1966 (4) could not be correlated with unusual conditions of any kind. Frequently the trees on poor sites are the first to be attacked in periods of stress, but the Cowichan Valley outbreak was on a good site.

Life history of the causal fungus

Diaporthe spreads by means of ascospores or conidiospores produced in fruit bodies embedded in bark affected by the canker (Fig. 2). Ascospores are forcibly shot from the sexual fruit bodies (perithecia) and are disseminated by the wind. Conidiospores ooze out of the asexual fruit bodies

Revised 1986

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(pycnidia) and are disseminated by rain water. Because the cankers persist for only one year, the life cycle is also annual. Occasionally the killed bark may persist on the tree and the fruiting period is extended beyond one year. The disease is endemic on suppressed trees and branches and becomes locally epidemic during environmental disturbances.

The asexual stage is more common than the sexual stage and either one may appear in the cankers. However, both stages have been found in almost every month of the year, indicating that the fungus is capable of spreading under many different conditions.

Conditions for establishment of infection and the mode of entry of the fungus are not known, but it is believed that stressed tissues, especially growing tips, may be invaded directly when cells lose turgor pressure due to lack of moisture. Stem cankers are frequently formed where a small shoot is invaded, and the infection spreads to the mainstem at its base (Fig. 1).

Fig. 1. Symptoms of Phomopsis canker. Note sunken canker area, resin flow and dead branchlet in center of canker.

Recognition

The cankers are characterized by the brown color of the bark and the sunken area in which the bark has been killed (Fig. 1). The cankers are frequently roundish or oval, well delimited, and the dead bark is sloughed in the following growing season (Fig. 2). This may be accompanied by a limited resin flow (Fig. 1).

In the dieback of growing tips, the bark characteristically has a blackish brown, scorched appearance (Fig. 3). The needles on the dead branch become brown or straw-colored and then drop.

Fruiting bodies appear on the dead bark as very fine pimples (Fig. 2). The sexual (*Diaporthe*) stage erupts slightly, but the asexual (*Phomopsis*) stage does not break through the bark.

Certain other microfungi can produce signs and symptoms which resemble Diaporthe damage on Douglas-fir. The picture is further complicated in that these fungi may be associated with *Diaporthe* in the infection, viz. *Sclerophoma pithyophila* (Cda.) Hohn., *Xenomeris abietis* Barr, *Dermea pseudotsugae* Funk (6). All of these fungi are weakly parasitic, but of less importance in the range of coastal Douglas-fir.

Fig. 2. Phomopsis canker with sloughing bark and fruit bodies of the fungus.

Damage

The outbreaks of this disease are sporadic and usually short-lived, but permanent damage may be inflicted by extensive top-killing, girdling and death of the whole tree. Usually, if only small cankers are formed or only the tips are killed, the damage will be remedied in the next growing season if growing conditions are favorable, leaving no permanent, serious defects.

Canker development occurs during the dormant season, killing the bark and the cambium. In the following growing season, the dead bark is sloughed and the cambium is regenerated through callus growth. This results in only a minor defect in the wood because the sapwood is not attacked.

Occasionally there are small losses to nursery stock in British Columbia due to killing of seedlings.

Control

The silvicultural practice of avoiding poor sites for Douglas-fir plantations will greatly reduce the incidence of this disease. Juvenile spacing in overcrowded natural stands will also help to control the disease. It is possible that *Diaporthe* is partly beneficial in helping to remove weakened trees and relieve crowding on mediocre sites.

In forest nurseries and domestic plantings, direct control is possible. Watering during long, dry periods will prevent weakening and predisposition to the disease. Application of protective fungicides has proved effective for control of other Phomopsis diseases of conifers in nurseries (7). Pruning of weakened and affected branches will help to control the spread of the disease.

Fig. 3. Top-killing and branch dieback caused by *Diaporthe lokoyae* on young Douglas-fir.

References

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(7) Smyly, W.B. and T.H. Filer, J. 1973. Benomyl controls Phomopsis blight on Arizona cypress in a nursery. Plant Dis. Reptr. 57: 59-61.

Additional Information

Samples of suspected Phomopsis cankers may be sent for identification to:

Canadian Forestry Service
Forest Insect and Disease Survey
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.

Canada

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